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(5922) A SOURCE-SINK BASED DYNAMIC MODEL FOR SIMULATING OIL AND PROTEIN ACCUMULATION IN SUNFLOWER ACHENES

Andrianasolo Fety NAMBİNİNA [1], Brun FRANÇOİS [2], Pierre CASADEBAİG [3], Champolivier LUC [1], Maury PİERRE [4], Debaeke PHİLİPPE [5]

[1] *TERRES INOVIA, FRANCE*
[2] *ACTA, FRANCE*
[3] *INRA, FRANCE*
[4] *INP-ENSAT, FRANCE*
[5] *INRA Toulouse, FRANCE*

debaeke@toulouse.inra.fr

ABSTRACT

The potential interest of a dynamic crop model is to provide reliable predictions of oil concentration (OC) soon before harvest as well as helping to understand at which time oil dynamics was affected by environmental stresses or management.

For that purpose, we proposed a "source-sink" based dynamic model describing on a daily step nitrogen and carbon assimilations and remobilizations during sunflower grain filling. Priority rules were established for C and N depletion from "source" organs, as well as for their allocation into "sink" organs. Photosynthesis was simulated using the radiation use efficiency approach and nitrogen uptake according to Pan *et al.* (2006) formalisms. Water and N stresses were computed by SUNFLO crop model from climatic and soil data and genotype characteristics. The "source" and "sink" variables were initialized at flowering and main outputs were oil and protein concentrations and weights per m². The model was calibrated on 24 crop situations in 2012 and evaluated independently on 50 other situations (3 years) with contrasted genotypes and environments. Global trends were well reproduced for all "source" and "sink" components but most variables tended to be overestimated. The main indicators of model quality for predicting OC were: RMSE = 6.1 (%), efficiency = 0.97, R^2 = 0.94 and Bias = -0.06 (%). A sensitivity analysis suggested us to reduce the number of parameters, better describe photosynthesis and N uptake processes, and improve the parameterization of genotype and nitrogen effects in order to decrease the prediction error and provide a relevant tool for OC prediction.

Key Words : source-sink model, seed oil content, seed protein content, C-N remobilization, C-N assimilation